

SCIENCE.

FRIDAY, APRIL 2, 1886.

COMMENT AND CRITICISM.

THE SUBJECT of agricultural experimentation is coming more and more to the front, both by the multiplication of state experiment stations, and through the endeavor to secure national aid. But, while the making of experiments in increasing numbers appears to be assured for the immediate future, the more important subject of the interpretation of experiments appears to receive but little consideration. It seems to be assumed, that, once an experiment is honestly made, its teachings will be so obvious that he who runs may read. As a matter of fact, however, the correct interpretation of the results of an agricultural experiment (we speak now of scientific experiments) is a matter of no little difficulty, and is deserving of equal attention with the making of the experiment. We are glad to note that the director of the New York experiment-station, in his last report, which we notice in another column, emphasizes the importance of a proper method of interpretation and of the application of the doctrine of chances. In the strictest sense of the word, no agricultural experiment can as yet be called scientific, because in none do we so fully understand the conditions as to properly control them. In all experiments with plants or animals, we have to reckon with the individual peculiarities of the organism; and, except under the most favoring conditions, there are other conditions which cannot be accurately controlled or allowed for. As a consequence, the final result of such an experiment, or series of experiments, is a probability, greater or less as may be, that a certain law holds. The subject is too broad a one to be discussed here; but we are convinced, that in proportion as agricultural experimenters learn to distinguish clearly just what and how much their experiments really prove, will they be in condition to make more rapid and certain progress in knowledge.

A CONTEMPLATIVE and retrospective naturalist can hardly escape the curious fantasy that the very term 'fishes' may become altogether ob-

solete, unless, indeed, it survives in the future as an historical reminiscence of the time when men thought there were 'fishes.' In fact, the word has lost by successive trimmings a large share of its ancient scope; for it is only by generous etymological tolerance that we graciously permit ourselves to still talk of the invertebrate cray-fish and shell-fish as fish at all, and we feel a comfortable sense of sustained politeness towards our more ignorant ancestors, while we order the waiter to fetch us some of the same tid-bit fishes. Then we learned to extend our linguistic purism to the very vertebrates, and became wise with the knowledge that those evident fishes, the porpoises and the whales, are not fishes at all. But the taste for lopping off the meaning from an innocent word had grown by indulgence; and so, having cut off the top of the fishes of our fathers, we turned to the bottom, which we added in our own day, and removed *Amphioxus*. We are quite agreed that the poor creature is not even a fish. Just at present we apparently are making ready for another discardment. The progress of science is rendering it clear that the sturgeon and his congeners — the ganoids all — are more nearly related to the amphibians than to the true fishes. Their development in the ovum is very closely similar to that of the frog and newt, and differs strikingly from that of the bony fishes and sharks. In the structure of the adults, too, the indications point to the same affinity. Of course, if the ganoids go, the dipnoans must go too, as every one will admit. Now appears Monsieur Fulliquet with a valuable study of the brain of one of the latter, *Protopterus*, and discovers that it is quite like that of an amphibian, and not at all like that of a true fish. Our perplexity fairly reaches its climax, and we wonderingly ask, Is any fish really a fish? If we can forecast the progress of the future by that of the past, we must answer, No.

THAT SOME PORTIONS of New South Wales are not desirable as permanent places of abode year in and year out, may be judged from the fact that during the past three years thirteen million sheep have died from want of water. It is maintained by some that the recent drought was by no means

unprecedented. The Darling River, in 1839, was merely a chain of water-holes; and again, ten years later, it was but little better; in 1851 the river was so dry that grass had grown in it, and in fact it was the only feeding-ground available; in 1863 and 1865, and again in 1868, the water was very low. In 1870 the great wet season began, and it was this superabundance of rain which led to the overstocking of the country and the consequent disaster. It is clear that those who occupy the western part of the colony have to encounter some very bad seasons, intermixed with some very good ones; and arrangements should be made by which the stock which in wet years may be supported, may be transferred to more favorable regions when the grazing fails, or to *abattoirs*, where it can be killed, and turned into canned or frozen meat. There now seems to be some hope for a return of rain, as the natives are reported to be moving to higher ground, and the white ants are said to have commenced building their curious elevated dwellings, which serve them as places of refuge during wet weather. These two indications are referred to by Australian journals as unfailing evidences of a probable change in the weather.

PERHAPS IN NO OTHER branch of zoölogy has the instability of nomenclature become more burdensome than in ornithology. He who, after a lapse of even a few years, attempts to renew his acquaintance with our bird fauna, is depressed and disheartened by the innumerable strange names and tedious lists of synonymes that he everywhere encounters. The Ornithologists' union has recently published a new check-list of North American birds that calls attention forcibly to this evil, but which also contains an excellent code of the principles and canons of zoölogical nomenclature, that, it is hoped, will be of some avail in lessening it. The committee appointed to draught this code was composed of five of our best students of vertebrate zoölogy, and may thus fairly represent the views held by the great body of zoölogists. The most important of the principles therein laid down are: the strict and rigid enforcement of the *lex prioritatis*, without any 'statute limitations' whatever of time; that a 'synonyme once is a synonyme always,' and that the same name cannot be retained for more than one genus in the animal kingdom; that a generic or subgeneric name may be based upon a designated recognizably described species;

and that the original orthography of a name is to be rigidly preserved, unless a typographical error is evident. With most of these principles zoölogists in general will agree. The necessity of inflexibility in the law of priority has steadily become more and more apparent; there is no mean position that does not admit of all manner of abuses, and the same may be said of the use of names that have once been synonymes. The last-mentioned principle is also a very important one. In entomology at least, and especially among many German purists, infractions of this safe rule have become in many cases almost unendurable. Those who, in their zeal for philological rules, amend, alter, or even reject names altogether, forget that nomenclature is not the end, but the means, of science. The Greek might write *αιμορραγια*, but the modern zoölogical classicist would insist upon haemorrhagia. The principle, however, that virtually admits catalogue generic names to recognition, will, we believe, receive vigorous protest from many zoölogists, as subversive of the essential rule that a species or genus must be described in order to be accepted. A specific description does not necessarily contain higher characters, and such characters must be given before a generic name can obtain currency. Students in distant parts of the world cannot depend upon specimens. A tyro can say such and such a species belongs to another genus, and give it a name, but it requires scientific discrimination to point out reasons. As well give to the bird-specimen No. 999 in the national museum a specific name, and leave the student to find out the characters as best he can. Ornithologists sometimes forget that rules applicable to their much-studied class may be intolerable in less-known groups.

PASTEUR AND HYDROPHOBIA.

THE place Mr. Pasteur now occupies in the minds of the world affords a striking example of the extremes to which the popular judgment is liable. On the one hand, we have in the 'Pasteur institute' an organization which proposes to put the new method of curing hydrophobia into operation on the largest scale in all civilized countries. At the other extreme we hear from many points the cry that all of Pasteur's pretensions are fraudulent. These extreme views are equally unwarrantable, and equally illustrative of the lack of sober judgment with which the world receives

such attempts as those of the eminent chemist and philanthropist. The sober-minded man should encourage every form of research designed to promote the interests of humanity; but he should at the same time reserve his judgment until sufficient data are at hand for reaching a well-grounded conclusion.

The efficacy of any method of treating hydrophobia must be extremely difficult to test in a way which shall be at all conclusive. The first difficulty we meet in reaching a conclusion arises from the extreme rarity of the disease. The number of readers of these lines who have ever had personal knowledge of a case of hydrophobia is probably very small. In the returns of the last census eighty deaths are reported from this cause in the United States. But we should regard this number as an extreme limit rather than as a well-established quantity, owing to the possibility of other forms of disease being mistaken for hydrophobia. On the other hand, the number of persons who are actually bitten by dogs which, for aught they know, might have been rabid, is very great. It is certainly to be estimated by thousands, and perhaps by tens of thousands. It becomes apparently much greater when, as during the past year, the public mind is excited on the subject. In such a case it is difficult to ascertain, to the entire satisfaction of the injured person, that any dog which may have bitten him was not rabid. The result is, that it is rarely possible to select any injured person as probably being inoculated with rabies. Of the persons brought into an institute for treatment, it may be assumed that only a small percentage would, under any circumstances, develop the actual disease.

Pasteur's supposed success cannot, therefore, be established as a fact until we have more complete evidence of the circumstances attending the injuries, and especially of the rabid character of the animals which have bitten his patients. Even of the well-established cases of bites by rabid dogs, only a minority ever develop into actual rabies, and this minority may require many months for the graver symptoms to appear. The first certain conclusion must therefore be founded on statistics in which the evidence that the animal was rabid shall be conclusive, and in which every result shall be included. A table showing the termination of all cases treated, and of all similar cases not treated, will ultimately be conclusive, and nothing less will serve the purpose. The efficacy of the treatment cannot be disproved

by occasional cases of failure, unless it is shown that these cases approximate in number those in which no fatal symptoms are ever developed. This also must depend upon the results of a statistical investigation.

No doubt, a profound impression has recently been made by the failure of the treatment in the cases of the party of Russians bitten by mad wolves; but this failure only shows that the treatment may fail in such extreme cases as these, which seem to have been unusually severe. It is quite conceivable that a process which would be entirely successful in cases so mild as to require several months for their development would prove useless when the quantity of virus injected was so great as to lead speedily to a fatal termination. It is significant that the first Russian to succumb was bitten by an animal so ferocious that one of its teeth was left deeply embedded in the flesh of its victim.

If the final conclusion should be against the efficacy of inoculation, are we to denounce the propounder of the treatment as a pretender? By no means. He will still be entitled to all the credit which society owes to a man who makes an honest attempt to promote its welfare. The character of the great experimenter is above suspicion; and the knowledge which he acquires, if not useful in one direction, may be useful in another. Let us, then, wish him well, and, if he fails, let us still award him the credit due to the spirit which inspired his efforts.

THE MALARIAL GERM OF LAVERAN.

DURING a recent visit to Rome, the writer had an opportunity to see, for the first time, a most interesting blood-parasite, which was first described several years since by Laveran, a medical officer in the French army. Extended researches made in Algeria had convinced Laveran of the constant presence of this parasite in the blood of persons suffering from malarial fevers, and that it is not found in the blood of healthy persons, or in that of those suffering from other diseases; also that it disappears from the blood under the administration of quinine, which is recognized as having a specific curative effect in diseases of this class.

There are many circumstances connected with the causation of the malarial fevers which make it appear probable that they are due, either directly or indirectly, to a living organism which finds its normal habitat in marshy places, and

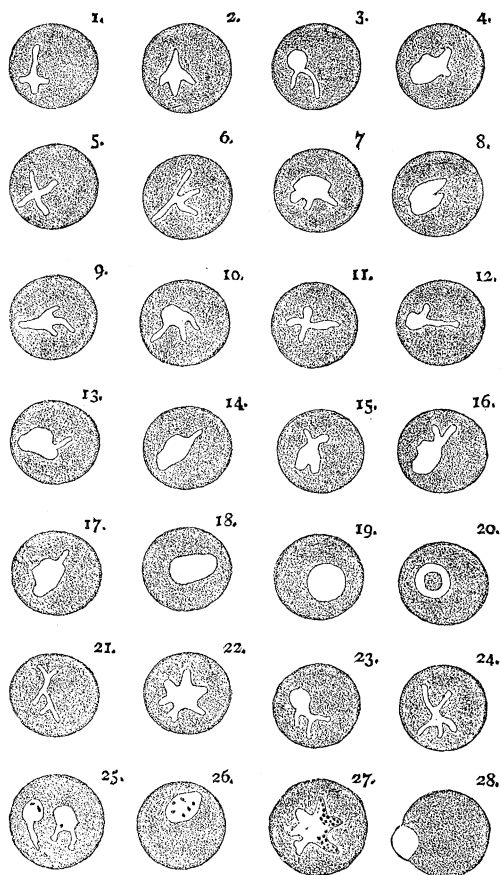
multiplies abundantly at certain seasons of the year, when conditions are favorable as to temperature, etc.

The general belief among physicians that there is a malarial germ, is, perhaps, the reason for the somewhat numerous pseudo-discoveries which have been announced. The most recent of these is the *Bacillus malariae* of Klebs and Tomassi-Crudeli. These gentlemen, in 1879, made researches in the vicinity of Rome, as a result of which they announced the discovery of a bacillus which they believed to be the veritable malarial germ. The evidence upon which their claim was based was obtained by experiments upon rabbits. The writer, in 1880, repeated their inoculation experiments with material obtained from the swamps in the vicinity of New Orleans, and showed that the fever which results from such inoculations does not correspond with the typical malarial fevers of man, and is, in fact, simply a form of septicaemia.

Nevertheless the *Bacillus malariae* received considerable credit in this country and in Europe, and many physicians were disposed to place it in the category of demonstrated disease-germs. On the other hand, the claim of Laveran received comparatively little attention. Among those who presented evidence in support of the malarial germ of Klebs and Crudeli was Professor Marchiafava of Rome. This gentleman has since continued his researches with reference to the causation of the malarial fevers, and finds himself compelled to abandon the *Bacillus malariae*. Indeed, I found no one in Rome who any longer attaches faith to this alleged discovery. But as a result of very extended observations, made in association with Dr. Celli of Rome, Marchiafava now fully confirms Laveran as to the presence of an amoeboid organism in the blood of patients suffering from malarial fever. Similar testimony had previously been given by Richard, a French army surgeon, who had excellent opportunities for such researches at Philippsville in Algeria. Space will not permit me to give a detailed account of the researches of these gentlemen, or of the different forms in which the parasite is said to present itself. The accounts show that it differs from all disease-germs heretofore discovered, inasmuch as it does not belong to the bacteria, and is not even a vegetable parasite. It is an extremely minute amoeboid organism, which is found free in the blood, or in the interior of the red blood-corpuscles (Marchiafava and Celli), or attached to them (Laveran and Richard). In a certain stage of its development it possesses from one to three or four flagella, and is endowed with active movements. But all of

the observers agree that this form is not very frequently encountered. Marchiafava and Celli only observed the flagellate organisms in four cases out of forty-two, in which the blood was carefully examined.

The accompanying figure is copied from the



FIGS. 1-20 represent the changes in form which occurred in a plasmodium, contained in a red blood-corpuscle, during a period of twenty minutes. FIGS. 21-27 give some other forms which the plasmodia, both with and without pigment, may assume. FIG. 28 represents a motionless plasmodium which is emerging from a red blood-corpuscle (the blood was examined after the attack of fever and the administration of quinine).

latest paper¹ by the gentlemen last mentioned, and represents the parasite as seen in the interior of the red blood-corpuscles.

As mentioned at the outset, the writer had ocular evidence of the presence of such an amoeboid organism in the blood of a patient suffering from a malarial fever, during a recent visit to Rome. Passing through the wards of the Santo Spirito Hospital with Dr. Celli, a case was selected

¹ 'Weitere untersuchungen über die malarieinfection,' in *Friedländer's Fortschritte der medicin*, Dec. 15, 1885.

which had not yet been subjected to medication, and in which a febrile paroxysm had just been inaugurated. A drop of blood from the patient's finger was brought directly under the microscope, and Dr. Marchiafava soon succeeded in demonstrating to me in a most satisfactory manner the presence, in several red blood-corpuscles, of the organism referred to. I saw the amoeboid movements very distinctly, and cannot doubt that the extremely minute, transparent, and apparently structureless mass which I was looking at was, in truth, a living organism.

The space at my disposal will not permit me to review the evidence in favor of the supposed causative rôle of this blood-parasite. It is evident that further researches will be required before this can be accepted as definitely settled; but I must call attention to the fact that all of the observers mentioned testify that granules of black pigment are frequently found in the interior of the parasite (figs. 26 and 27). Pathologists have long since recognized the presence of similar pigment in the blood and in various organs as a distinguishing characteristic of malarial disease; and it has been generally agreed that this pigment has, in some way, had its origin from the haemoglobin of the red blood-corpuscles. These, by some agency, are destroyed in large numbers during a malarial paroxysm. This has been proved by actual counting of the number of corpuscles in a given quantity of blood drawn before and after the paroxysms, and is made apparent by the rapidly developed anaemia which results from malarial attacks.

Marchiafava and Celli propose to call this organism *Plasmodium malariae*. Laveran has abandoned the name first suggested by him—*Oscillaria malariae*—for the reason that it might lead to the mistaken supposition that the parasite in question belongs to the Oscillatoriaceae, a family of confervoid algae: we are therefore at liberty to accept the name suggested by Marchiafava and Celli, until such time, at least, as the life-history of the parasite has been worked out, and its proper relations determined.

Finally, we may mention that Marchiafava and Celli report several cases in which they have been successful in producing characteristic attacks of malarial fever by injecting into the circulation of persons free from such disease a small amount of blood drawn from the veins of a patient suffering from a malarial attack. In these cases the presence of the blood-parasite described was verified in the blood used for the inoculation, and subsequently in the blood of the inoculated individual when he was seized with an intermittent fever as a result of such inoculation. It is also

stated that the parasite disappeared from the blood under the influence of the administration of quinine, by which the induced malarial disease was promptly cured. GEORGE M. STERNBERG.

A TRADE-ROUTE BETWEEN BOLIVIA AND THE ARGENTINE REPUBLIC.

THOUAR, whose departure for a new exploration of the Pilcomayo we have already noted, announces his safe return and successful accomplishment of the work attempted. The party, comprising twenty-three men, and two officers of the Argentine army, and a volunteer, Mr. Wilfrid Gillibert, left Fotheringham on the 5th of October, and reached the locality called El Dorado, two miles above the rapids, Nov. 12. Several encounters with the Indians had previously taken place, but here the explorers came upon a perfect ant-hill of Tobas. There were over two hundred huts, and about fifteen hundred Indians, against whom a victorious combat was waged, the Toba chief falling early in the conflict. After the fight, the explorers remained in camp on the spot for six days, minutely examining the obstructions in the river, and making canoes, with which, on the 18th of November, they started down the river, reaching the Paraguay Dec. 5, after two months of great hardship. They lost one man killed, and three disabled by wounds or dysentery.

The object of the exploration was to determine the character of the obstructions to navigation reported by Major Feilberg, and therefore the possibility of using the Pilcomayo as a commercial highway between Bolivia and the Argentine Confederation. In brief, the conclusion reached by Thouar is, that the so-called rapids are not of a serious character, being composed of soft tertiary rock, easily removed, and, even as they are, not impassable; since Father Patiño ascended them with his boats in 1721, and safely reached the borders of Bolivia. The depth of the river up to this point, at low water, averages eight feet; and beyond it, nearly five feet, with a rise in flood-time of over twenty feet. There are comparatively few snags or sand-banks. The channel, in floods, is clearly marked by the lines of high trees which border it, even when the plains beyond the channel are flooded. The channel is about thirty yards wide, and the current averages two miles an hour. Steamers of two hundred tons, drawing not over two feet and a half of water, could ascend the river to the Bolivian mission of Solano at any stage of the water. On the strength of this favorable report, an international committee has been formed, composed of Bolivian and Argentine officials, engineers and capitalists,

to open the route to commerce. The boundary is to be determined, and then operations will commence at once.

The services of M. Tifouar have been recognized by the Bolivian congress, which has voted him a gold medal, five square leagues of land, and thirty thousand francs, for the publication of his maps and reports. The Argentine government has promoted the officers of his escort, and given a month's extra pay to the private soldiers. The explorer himself will devote himself to the perfection of the methods projected for the promotion of commerce on the Pilcomayo.

SURFACE-COLLECTING ON THE ALBATROSS.

DURING the past year surface-collecting has been very successfully carried on by the fish-commission steamer Albatross, and not only have many additions been made to the surface-fauna off our coast, but, what is at least of equal importance, rare forms have been taken in numbers sufficient for detailed microscopic study.

The nets chiefly employed in this work are ten feet long and of half-inch mesh; their mouths are four feet in diameter. The outer two-thirds are lined with a fine webbing, and the end is closed by several turns of stout lashing put on with care, to protect these linings from strain. They are suspended from the swinging booms, and, five-eighths submerged, towed at the rate of two knots an hour; each net, under these conditions, straining nearly twelve thousand gallons of water per minute. They are not, of course, adapted to the capture of the smallest forms of life, for which purpose fine silk nets of much less diameter are employed.

As might be supposed, the amount of material taken in this way is large. When surface-life is at all abundant, surface-fish and the young of some bottom-fish, the mature and immature forms of crustacea, various pelagic forms of mollusca, and jelly-fish of all sizes, are represented in the average haul.

Perhaps special mention should be made of the capture of argonauts and of several species of file-fish (Balistidae). Argonauta argo has been taken a number of times clinging to gulf-weed; and a fine specimen of another species of argonaut was taken from the under surface of a jelly-fish, to which it tenaciously clung. Unsuccessful efforts have been made to bring in alive argonauts captured during the short summer cruises of the steamer from Wood's Holl, Mass.: perhaps failure was due to the change from the warm water of

the Gulf-Stream region to the cold water inshore. In an aquarium these animals swim about with a slow, undulating, rhythmic motion, sometimes holding themselves poised for a while, and then, by a sudden turn of the siphon, darting with ease in any desired direction. When swimming, the expanded and partially transparent membrane of the dorsal arm adheres so smoothly to the side of the shell, that it requires close observation in a strong light to detect the fact that it is covered.

The file-fish is found under gulf-weed, and is captured when the ship slows down for dredging or sounding. A specimen of this fish three inches and a half long, together with a piece of drift-wood covered with barnacles (Lepas), was placed in an aquarium. It immediately began to prey upon the barnacles thus: holding itself in readiness, it waited for the intended victim fully to extend its cirri, which the fish then, by a sudden onslaught, seized, and, backing swiftly away, dragged the greater portion of the animal from its shell. The attack of the fish was not always well-timed, and, failing in its purpose, its solid jaws brought up with a sharp click against the closed shell within which the coveted morsel had safely retreated.

Science has already noted the fact that the electric light is an important aid in surface-collecting. A single Edison-light bulb protected by a wire cage, and furnished on the upper side with a shade, is lowered a few inches under water by an insulated cable, which is then made fast. Light, silk bolting-cloth scoop-nets, fastened to long bamboo poles, are held in readiness above the illuminated area. The larger part of the material collected by these nets, especially in shallow water, is composed of small crustacea and worms, which the light often attracts in swarms.

At Wood's Holl, small schools of herring (Clupea) frequented the lighted area to devour the sexual form of certain worms (Nereis limbata and N. megalops). A number of specimens of this fish were taken with flies improvised to resemble these worms. The argonaut has been captured under the light, probably by accident. Squids, however, appear in numbers, apparently allured from some distance. The flying-fish often swims sluggishly towards the light, its wing-like pectoral fins more or less extended on the surface of the water, and quite motionless. If startled, it rises instantly in the air, and disappears in the darkness like a frightened bird. When taken unharmed from the scoop-net, it exhibits a wing-movement like that of the humming-bird or sphinx-moth, and seems to demonstrate its claim to true flight.

With the abundant material for close structural

study secured by these combined methods, it is to be hoped that we soon shall be as well acquainted with the surface-fauna off our coast as we now are with the bottom-fauna.

JAMES E. BENEDICT,
Resident naturalist of the Albatross.

EARTHQUAKE OBSERVATIONS.

THE occurrence of an earthquake, although not such an uncommon event in this country as most people suppose, rarely finds observers alert enough to make observations which, when sifted of hearsay and ambiguity, contain facts of much value to science either as to quantity or quality. As a guide to the information desired, it would be well to bear in mind the list of questions adopted in the circular to be issued by the U. S. geological survey, as follows:—

1. Was an earthquake shock felt at your place on the day of _____, 18 ? (A negative answer is as important as an affirmative one.)

2. At what hour, minute, and second of standard time was it felt?

3. How long did its perceptible motion continue?

4. Was it accompanied by any unusual noise? If so, describe it.

5. Was more than one shock felt? If so, how many?

6. Which of the following measures of intensity would best describe what happened in your vicinity? No. 1. Very light, noticed by a few persons, not generally felt; No. 2. Light, felt by the majority of persons, rattling windows and crockery; No. 3. Moderate, sufficient to set suspended objects, chandeliers, etc., swinging or to overthrow light objects; No. 4. Strong, sufficient to crack the plaster in houses or to throw down some bricks from chimneys; No. 5. Severe, overthrowing chimneys, and injuring the walls of houses.

7. Do you know of any other cause for what happened than an earthquake?

This list was proposed by Capt. C. E. Dutton, in charge of the division of volcanic geology, with the advice of Profs. C. G. Rockwood, T. C. Mendenhall, W. M. Davis, and H. M. Paul. A negative answer to the first question, from an observer near the disturbed region, is of course valuable as showing the limits of the disturbance. The second question, as to the time, is the most important of all; and an immediate comparison of the time-piece used, with standard time at the nearest railway-station or elsewhere, is particularly desirable.

Experiments are now being made as to the best form of seismoscope for the use of selected observers, while more refined observations with seismograph and chronograph can of course only be undertaken where there are special facilities, as at regular observatories, etc.

GEOGRAPHICAL NOTES.

Uape Indians of the Amazon.—We derive from Henri Coudreau some interesting notes on the ancient race of Amazonian Indians known as the Uapè. These people are generally below the average height of Europeans, and their complexion varies from light brown to something like a chocolate tint. Their hair is black and smooth; with rare exceptions, reddish or even blond. They possess a personal odor almost as strong and disagreeable as in some Africans, but which is not due to want of cleanliness, as they bathe several times a day. Though quiet in their manners, they are very independent in their habits, and when intoxicated, which often occurs, are insolent, violent, and cruel. They have religious and secular festivals called respectively 'cachiri' and 'dabucuri.' These consist chiefly of dancing and indulgence in intoxicating preparations of coca, wild hemp, and other herbs, and ceremonial tobacco-smoking. The cachiri-drink is made in a canoe-shaped wooden vessel, around which both sexes dance in a sort of procession, each individual putting his right hand on the shoulder of the person preceding him. The line is led by the chief singing, while the rest join in a refrain. They are deceitful and perfidious, and do not hesitate to use poison against enemies. The drug is extracted from a species of arum, and, in small doses, produces death by anaemia and innutrition after a month or two: strong doses produce immediate insanity. Their food comprises game, fish, fruits, and manioc-farina; they are very fond of several sorts of large ants. Their houses are built of wood, long, with a door at each end, thatched, and accommodating as many as fifteen families under one roof. They are generally dirty and ill-smelling. The furniture consists of hammocks, pottery, trunks of Brazilian manufacture, and a variety of odds and ends, beside their weapons, nets, and baskets. At one side is a small shed, where the farina is cooked on a hearth. There is often a small flotilla of canoes belonging to the inhabitants. These people make excellent canoes, some of which are large enough to seat thirty people, and sell readily for a handsome price at the Brazilian towns. The most singular of their industries is that by which they obtain salt. A plant grows in the district of Carurù, a stout herb

a foot and a half high, which is pulled up and burned, and the ashes leached with boiling water. On this an abundant scum arises, which is removed and dried. This is the salt which, white at first, afterward becomes grayish. It is a little bitter, but replaces ordinary salt for all purposes. It is curious that such uncivilized people should have discovered such a process.

The newly discovered affluent of the Kongo.—The river traversed by Lieutenant Wissmann, to which reference was made in a late number of *Science* (vii., 160), proves, as we suspected, to be one long indicated on the charts, partly under the name of Ikelemba. It is called by Wissmann the Kassai, and at different points is named the Zaïre, the Maneme, and the Kwa. It receives near its mouth the waters of the Kwango and the drainage of Lake Leopold II. It has a navigable length of about four hundred miles through a rich region with many probably navigable branches. Hippopotami were very abundant, in some places obstructing canoe navigation; eighty-two were counted in one herd. The mouth of the Kassai does not indicate the importance of the stream, which is probably the reason why it has not sooner been explored. According to Lieutenant Wissmann, the commercial future of the whole Kongo state depends upon the construction of a railway from Vivi to the upper Kongo valley.

PARIS LETTER.

SINCE my preceding letter, some very interesting facts have been made known in different sittings of the Academy of sciences or other learned societies. But I must begin by repairing an omission in my last letter, and mention Professor Verneuil's paper concerning phthisis. As it is generally conceded at present that phthisis is a parasitical disease, M. Verneuil proposes that a fund be especially raised for the purpose of studying the *Bacillus tuberculosis*, to try and find out some scientific and methodical way of fighting this microbe. M. Verneuil's letter has been published in the *Gazette hebdomadaire* and in many other papers; but I do not think that much money has been yet raised. M. Verneuil is no micrographer, and has never studied any bacillus or bacterium. His idea is a very good one, but he is not the man, nor does his name carry the weight necessary to make the idea work a long way in the world.

At the last meeting of the Société de psychologie physiologique, I listened to an interesting note by MM. Richet, Ferrari, and Hericourt, concerning the way in which the handwriting varies according to the suggested mental states of hypnotized persons. For instance, if such a person is

told that he is Napoleon, and asked to write a letter, he writes one, in a handwriting entirely different from his own, in which a graphologist easily recognizes the signs of a certain mental state which is generally supposed to have been that of Napoleon; when told that he is a miser, he writes in a close, short, economical handwriting, in the way misers write, according to graphologists; as a peasant, he writes in a drawing, ugly hand. The conclusion drawn by these gentlemen is, that graphology is a real science, and that its main features are correct, generally speaking. After all, there is nothing wonderful in the fact that handwriting can be and is influenced by the mental state, as is the case in physiognomy, attitude, and movements. The papers of MM. Richet, Ferrari, and Hericourt, will be published in the *Revue philosophique*, and their experiments are being continued.

A fortnight ago, the Société géologique began a series of conferences, to be held now and then at the ordinary meetings of the society. The opening address was made by M. A. de Lapparent, the well-known author of a very good book on geology, a text-book for French students. The subject was 'The form of the earth,' and M. de Lapparent communicated very interesting facts on the question. The most important, which is also the one that contributes the most to give to the earth a very irregular form, is the attraction which continents and even islands exert on water, as they do on the pendulum, resulting, as has been proved and measured, in an accumulation of sea-waters around continents. Thus the continents are all situated at the tops of hills of water; and to go from Europe to America, the ship has first to go down hill, then to cross a valley, and finally to climb another hill. Of course, this is an exaggerated figure; but, if the world were flat instead of round, the case would be exactly such as I have just said, for it has been calculated by some that between two continents the sea-level, in the middle, may be a thousand metres below the level the sea ought to have, and would have if there were no continents to attract it. As a curious and interesting confirmation of this attraction of seas by continents, it has been noticed that when Vesuvius is in eruption, and consequently when the mountain itself is denser on account of ascending and issuing lavas, the sea-level of Naples rises in a sufficiently well-marked manner.

M. de Lapparent, who does not think that there is any great motion in continents, and does not much believe in the sinking of some and the emersion of others, tries to explain the fact frequently met with, of sea-level and sea-beaches standing many hundreds of feet above the actual sea-level, in the following manner. Suppose a

large country without any ice at all, — no glaciers nor icebergs: the sea will take a given level around such a country. But suppose that for some reason or another this country gets covered with snow and ice, as is the case in polar regions: the sea-level will rise, because the continent will be denser, and will attract the sea with more force. But if half of the ice melt, the sea-level will be lower: if it melt entirely, the waters will re-assume their first level. We should then find on the seacoast three levels, — the actual one; one very high up, say a hundred yards; and another one halfway down. This explanation may perhaps be accepted for some countries, but it seems doubtful that it applies to all cases; and the theory of slow emersion and immersion of continents and islands — some of them, at least — cannot yet be overthrown. The conference of M. de Lapparent will be published in the Bulletin of the geological society, and a review of it is to come out shortly in *Nature*.

The principal event of the last month has been Pasteur's paper, read at the Academy of sciences the 1st of March, concerning the cure of rabies. The meeting was a very fine one. Some persons had heard it rumored that Pasteur was to speak, and to communicate very interesting facts, so the room was quite full. M. Gosselin, who had been sick for some time, came; and nearly everybody was there, except M. Chevreul, who was yet obliged to stay at home on account of the bad weather and a slight illness. M. Pasteur's note was a very long one, but it was listened to with great attention; and at the conclusion enthusiastic applause went up from every hand. M. Vulpian rose immediately after, and proposed that a vaccinal dispensary be erected for the purpose of admitting all persons bitten by rabid dogs, and having them cured by M. Pasteur and his assistants. The fact is, that it is necessary to be able to receive all persons, French or strangers, who desire Pasteur's assistance, and to have some sort of hospital. M. Vulpian's proposal was greeted with many cheers, and M. Pasteur quite approved it. The results of Pasteur's 350 first experiments on the cure of rabies in mankind are certainly very encouraging, and the subscribers are sending a good deal of money. Pasteur is sure to have all the money that is necessary, and will certainly use it well. He wishes to investigate now the question of diphtheria, and to try and find out the way of preventing or fighting it. It is to be hoped also that tuberculosis may catch his attention. Tuberculosis is far deadlier than cholera, diphtheria, and rabies put together.

Apropos of cholera, M. Rochefontaine, who was director of Professor Vulpian's laboratory, died a

few days ago. It will be remembered that Dr. Rochefontaine tried last year an experiment on the etiology of cholera, swallowing a pill in which choleraic dejections and bacilli formed the prominent feature. He recovered, and some months ago he began again, in another manner, inoculating bacilli under the skin. It is, however, believed here that these experiments were very detrimental to his health, and that his sudden death, in the course of a very mild illness, may have been the consequence of them. Professor Vulpian made a very heartfelt and appropriate speech at the burial. Rochefontaine has been during seventeen years the *préparateur* and the assistant of M. Vulpian: he was, in fact, his only pupil, as concerns experimental physiology, and his death is a very serious blow to Vulpian, who will certainly not find so experienced an assistant to help him.

M. A. Gautier, the professor of organic chemistry in the faculté de médecine, pupil and successor of Würtz, has recently published a very interesting paper, read before the Academy of medicine, concerning ptomaines and leucomaines. Leucomaines are alkaloids very similar to ptomaines, but they are formed in the living body and during life, instead of developing after death. They are very poisonous. In the next letter, I shall perhaps be able to give more information on this point.

The Concours d'agrégation at the Medical school was finished yesterday evening at half-past six, after some two months' duration. The candidates who have been admitted are MM. Brissand and Ballet, two of Charcot's pupils, neither of the best nor of the worst; M. Déjérine, Vulpian's pupil, very well known by quite a number of papers and contributions on nervous pathology and physiology — he certainly is the best man of the four in the estimation of all, and is a very good recruit for the faculty; M. Chauffard, son of the well-known spiritualist professor, who died some years ago — he has no works to speak for him, being yet very young, but his *concours* was a very brilliant one. V.

Paris, March 17.

NOTES AND NEWS.

ON the 25th of March, 1826, Alvan Clark, the senior member of the famous firm of telescope-makers, was united in marriage to Miss Maria Pease, and the venerable couple are still living, the former at the age of eighty-two, and the latter seventy-eight. A reception was given in honor of the sixtieth anniversary of their marriage. During the past year Mr. Clark has painted three

large portraits in oil, — of his two sons, Alvan and George, and of a grandson. Portrait-painting was Mr. Clark's profession till he was forty years of age, when, by trying to assist one of his sons, then a student, in the grinding of a reflector for a telescope he was making for his own use, his attention was first directed to the grinding of optical surfaces as a business.

— Captain Eden of the British schooner *Storm king*, bound from Utila to New Orleans, reports on Thursday, March 11, passing over a submarine mineral-oil spring, bubbling and rippling all around the vessel, and extending out over one hundred and fifty to two hundred yards. This was in latitude $25^{\circ} 48'$ north, longitude $86^{\circ} 20'$ west, about two hundred and fifty miles southeast of the passes. At 11 A.M. they were over the spring proper, and at 11.30 A.M. outside the circumference of the oil-circle. It is supposed that this spring is the oil-cargo of a foundered vessel, which, breaking through the casks, caused this peculiar marine freak, or that it may be a natural phenomenon.

— The *Railroad gazette* cites one of the longest times in which fire has been kept in a furnace without the addition of fuel. A furnace belonging to the Kemble iron and coal company at Riddlesburg, Penn., was banked up and hermetically sealed in November, 1884, fire being left in. On March 5, 1886, the furnace was opened, after being closed for nearly sixteen months. The fire was found to be still burning, the coke glowing brightly, and, on the admission of air, soon became hot enough to melt cinder. It was started as easily as if it had been standing but a week.

— A railroad company in southern Kansas has established a large artificial plantation of forest-trees to supply their future needs. Over a square mile of land near Farlington has been planted with young saplings of the catalpa and ailantus. The prospective success of their experiment has brought about the similar planting of another equal area. These trees are of rapid growth, and are valuable for ties and fencing-material.

— The first international congress of hydrology and climatology will convene the 1st of October next at Biarritz, and will last eight days. Communications and inquiries may be addressed to the Viscount de Chasteigner, at Biarritz.

— The March number of the Johns Hopkins university circulars contains abstracts of several scientific papers of value, read before the scientific and philological association of the university, as follows: 'Instantaneous photographs of the heart and intestines in motion,' by Dr. Thompson; 'On

the antiseptic action of acids,' by Mr. Duggan; and on 'Speech mixture in French Canada,' by Mr. Elliott.

— The next volume of the 'Encyclopaedia Britannica' will be issued about the middle of this month. Among the principal articles will be 'Psychology,' by Mr. J. Ward; 'Railways,' by Messrs. D. K. Clark, A. T. Hadley, A. M. Wellington, and S. W. Dunning; 'Animal reproduction,' by Mr. P. Geddes; 'Vegetable reproduction,' by S. H. Vines; 'Reptiles,' by Dr. A. Günther and St. G. Mivart; 'Respiration,' by Prof. A. Gamgee; 'River-engineering,' by L. F. Vernon-Harcourt; and 'Roman topography and archeology,' by J. H. Middleton.

— The *k. k. naturhistorischen hofmuseum* at Vienna has begun the publication of *annalen*, under the editorship of Dr. Franz v. Hauer, the superintendent. The first number, lately issued, contains a report for the year 1885, which will be of interest to those concerned in the management of museums. The *personnel* of this important museum includes many names, such as Pelzeln, Rogenhofer, Fuchs, Brezina, Brauer, Marenzeller, Heger, Szombathy, and others, more or less widely known as eminent scientific men. Altogether the staff of curators, assistants, and servants, numbers forty-four. The next number will appear in May, and will contain zoölogical, botanical, and mineralogical papers by Steindachner, Kohl, Beck, Brezina, and others.

— A new enterprise of considerable importance is announced in Germany. It is the issuance of a *Handbuch der klassischen alterthumswissenschaft in systematischer darstellung*, which will deal with the entire field of classical philology and archeology, with especial reference to the history, method, and bibliography of the respective departments. The work will be complete in seven volumes, — of which three parts, comprising a volume and a half, have already appeared, — and is edited by Professor Müller of Erlangen, assisted by Professors Blass of Kiel, Brugmann of Freiburg, Busset of Kiel, von Christ of Munich, Hübner of Berlin, Jordan of Königsberg, Lolling of Athens, Niese of Breslau, Nissen of Bonn, Reifferschied of Breslau, Schiller of Giessen, Schanz of Würzburg, von Ulrichs of Würzburg, and Windelband of Strasburg. This array of distinguished names ought to insure a work of great interest and value.

— We have received a translation into the German, of Auchincloss's well-known work on valve-gearing of steam-engines. The original was published by Van Nostrand in 1869, and a second edition in 1883. It has been a standard

treatise on the subject in this country, and, with Zeuner and Blaha in Europe, has given the engineer exceedingly valuable methods of treatment of all problems arising in the designing and adjustment of the slide-valve. The work, both of author and publisher, is well done; and our German friends are to be congratulated upon having so good a reproduction of what has long been considered in the United States, in many respects, an exceptionally valuable treatise.

— Mr. S. S. Bassler, of the *Cincinnati commercial gazette*, has lately published a timely little pocket-pamphlet entitled 'The weather chart,' in which he illustrates the types of areas of high and low pressure that cross our country, and control its weather, by small sketch-maps for recent dates, still in the minds of his readers. The object of the essay is a good one, and the examples are well chosen; but we regret that more care is not taken to secure accuracy in its explanatory statements. It is very questionable whether correct ideas can be gathered from such phrases as, "Could we go beyond the limits of the atmosphere, and look down upon its surface, we should see a constant succession of hills, valleys, plains, and areas of tempestuous cross-waves." It is true that in the lower atmosphere the imaginary isobaric surfaces would be thus deformed, in accordance with changes in temperature and density of air; but there is every probability that these irregularities are all smoothed out long before the limits of the atmosphere are reached. And it is to be regretted that one who has done so much good work in popularizing his favorite study should degrade its terminology by the frequent use of such words as 'high' and 'low,' instead of the better ones 'anti-cyclonic' and 'cyclonic systems,' which appear but a few times.

— Robert Oppenheim of Berlin announces a 'Führer für forschungsreisende' by Dr. F. v. Richthofen. This book is intended as a guide for travellers in making observations of interest in physical geography or geology. It is intended especially for those who, without special knowledge in those sciences, yet have some acquaintance with their rudiments.

— The following works of interest to scientific readers have been announced: 'Creation or evolution,' by George Ticknor Curtis (*Appleton*); 'Fresh-water fishes of Europe, a history of the genera, species, structure, habits, etc.,' by H. G. Seeley (*Cassell*); 'Electric lighting,' translated from the German (*Cupples, Upham & Co.*); 'Can matter think?' by Elliott Coues (*Estes & Lauriat*); 'Geological studies,' by Alex. Winchell (*Griggs & Co.*); 'Builders' work and builders' trades,' by H.

C. Seddon (*Lippincott*); 'Avoidance of collisions at sea,' by W. Bainbridge (*Van Nostrand*); 'The luminiferous ether,' by Volsen Wood (*Van Nostrand*); 'Evolution of to-day,' by H. W. Conn (*Putnam*); Anthony and Brackett's 'Text-book of physics' (*Wiley*); 'Arctic explorations in the nineteenth century, from Ross to Greely' (*Allison*); 'At home in Fiji,' by Gordon Cumming, new edition (*Armstrong*); 'Persia, the land of the Imans,' by James Bassett (*Scribner*); 'The Kilimanjaro expedition, scientific exploration in eastern equatorial Africa,' by H. H. Johnstone (*Scribner*); 'What young people should know,' revised edition, by B. G. Wilder (*Estes & Lauriat*); 'A history of education,' by F. v. N. Painter (*Appleton*); 'A science of mind,' by J. H. Seelye (*Ginn & Co.*); 'The philosophy of wealth,' by J. B. Clark (*Ginn & Co.*); 'Our government,' by J. Macy (*Ginn & Co.*); 'General geology for high-schools and colleges,' by N. S. Shaler (*Heath*); 'Guides for science teaching,' four volumes (insects, fishes and frogs, birds, and mammals), by Alpheus Hyatt (*Heath*); 'Introduction to the study of philosophy,' by G. Stanley Hall (*Heath*); 'Modern petrography,' by George H. Williams (*Heath*); 'Industrial training,' by C. M. Woodward (*Heath*); 'A handbook of plant dissection,' by J. C. Arthur, C. R. Barnes, and J. M. Coulter (*Henry Holt*); 'The calculus,' by Simon Newcomb (*Henry Holt*); 'Elementary zoölogy,' by A. S. Packard (*Henry Holt*); 'Wood's medicinal plants,' American edition, by Charles Rice (*Wood*); 'The railways and the republic,' by James F. Hudson (*Harper*); 'Society, its peculiarities, practices, and problems,' by G. C. Lorimer (*Funk & Wagnalls*); 'Essays on finance, wages, and trade,' by R. Giffen (*Putnam*); 'Theism and evolution,' by J. S. Van Dyke (*Armstrong*); 'University education,' by G. S. Morris (*Andrews & Witherby*); 'Educational value of different studies,' by W. H. Payne (*Andrews & Witherby*); 'Mineral physiology and physiography,' by T. Sterry Hunt (*Cassino*); 'Methods of teaching and studying natural science,' edited by G. Stanley Hall (*Heath*).

— *The future* bears every mark that distinguishes publications of its class. The system on which its author, C. C. Blake of Richland, Kan., bases his "calculation of the coming weather through astronomical mathematics," is modestly entitled 'Cosmogony,' and in the April number of the paper its explanation goes so far as concluding that there is no such thing as matter, and motion only exists. By a vague series of inconsequences, it is shown that the earth is built up by gradual accretion of rays from the sun: "it is the gradual growth of the earth by absorption from the sun

that is the cause of the secular acceleration of the moon, which the best of astronomers have not been able to account for." The egotistical self-sacrifice that pervades the sheet is more pitiful than its teachings are dangerous.

— *The weather journal*, issued weekly at Cincinnati, by S. S. Bassler, the weather editor of the *Commercial gazette* of that city, is quite unlike most journals afflicted with meteorological titles in this country: it has nothing to say about cosmogony, or the influence of Saturn, but gains its high value from a set of twenty-one little maps in each issue, giving the isobars and something of the winds, temperature, and precipitation, three times for every day of the week of its publication, constructed according to the signal-service observations. Although too small to contain much detail, the maps show with sufficient clearness where the centres of high and low pressure are to be found, and the accompanying text is designed to explain the simpler principles of weather forecasting on this basis. We trust it may secure the large circulation that it well deserves, and that the maps may at the same time gain somewhat in clearness of execution in response to the requests of numerous subscribers.

— The first annual summary of observations made at the Blue Hill meteorological observatory, near Boston, was lately issued by Mr. Rotch. It contains a detailed statement of monthly and annual means, extremes, and ranges for 1885, placed side by side with similar records from the Boston signal office, ten miles north of, and five hundred feet lower than, the observatory. The mean annual values of several elements are as follows: pressure (reduced to 32°, sea-level and standard gravity), 29".962 and 29".964; temperature, 44°.4 and 47°.1; total wind movement 166, 110, and 102,829 miles; total precipitation, 39.00 and 46.85 inches. Mr. Rotch is contributing a series of articles on the mountain meteorological stations of Europe to the current numbers of the *American meteorological journal* that will prove of much value to students in this country, not only by informing them where high-level observations are made, but also by directing them to the publications in which they are recorded and discussed.

— The general detailed map of the United States, proposed and already begun by the U. S. geological survey, will be upon the scale of about four miles to the inch, with contour lines for every twenty-five to two hundred feet, according to the nature of the topography. It is proposed to issue this map in atlas sheets, each composed of

one degree of latitude by one of longitude, bounded by parallels and meridians.

— The first number of the *International record of charities and correction*, edited by Mr. F. H. Wines, and published by Putnam's Sons, has been received. The *Record* aims to make popular the literature of the subject to which it is devoted, to interest the public in such questions, and to show "what progress is making in the struggle for the relief of human suffering, and the elevation of the race." The general subject which will be discussed in its columns is 'social evils, their causes and remedy.' The editor names as the five great evils with which humanity has to contend, poverty, ignorance, disease, vice, crime.

— A local hurricane at Murraysville, Penn., on March 21, which caused considerable damage to property, has been ascribed to the heat produced by the conflagration at the large gas-well there.

— The French consulting committee of hygiene, we learn from *Nature*, recently advised the prohibition of the use of vaseline for butter in food-preparations. The effects of vaseline on the system, however, seemed to require fuller examination, and Dr. Dubois has made some experiments in regard to it. Two dogs were fed exclusively on soup in which the usual fat was entirely replaced with vaseline: one of them absorbed twenty-five grams of vaseline a day for ten days; the other fifteen grams (this would correspond, in the case of an average man, to one hundred grams and sixty grams respectively). With this diet the animals even slightly increased in weight. Their general state was good: there was no loss of appetite, nor vomiting, nor diarrhoea. In general, it may be said that the carburets of hydrogen forming vaseline, though they favor neither oxidation nor saponification like fats, are readily tolerated in the alimentary canal, at least in the case of dogs. Further experiments will show if a prolonged use of the substance is equally innocuous.

— The report of Mr. Hodgson to the Society of psychical research, denouncing the theosophists and Madame Blavatsky, has been replied to, says the London *Graphic*, by Mr. A. P. Sinnett, in a pamphlet called "The 'occult world phenomena' and the Society for psychical research" (*Redway*). It is not, it does not indeed pretend to be, a complete answer to the many points raised by Mr. Hodgson. There is no attempt, for example, to explain the existence of the damning Coulomb letters. But Mr. Sinnett scores some points against his adversary, and his pamphlet is to be followed by some memoirs of Madame Blavatsky,

which may contain further refutations. Madame Blavatsky herself appends to the pamphlet a brief and indignant denial of the grave charges which have been made against her.

— The success of the U. S. fish commission has caused complaints in England of the negligence of that government in matters pertaining to the fishing interests. The *Athenaeum* states that at the present moment there is not in the three kingdoms one scientific naturalist employed by the government to whom it has the right to apply for information on fishery questions. It is now said to be the intention of the government, however, to form a new fisheries board or commission.

— Caustic lime, ground fine, and consolidated by a pressure of forty tons into cartridges two inches and a half in diameter, is used in some collieries for getting coal, where gunpowder would be dangerous. After the holes are drilled in the face of the coal, an iron tube half an inch in diameter, with a small groove externally on the upper side, and several perforations, is inserted the whole length of the hole. The cartridges, which have a groove to fit the tube, are then inserted and lightly rammed, and the hole tamped. A small force-pump injects through the tube a quantity of water equal in bulk to the lime. The water escapes through the perforations and along the groove, saturating the whole, and driving out the air. The tube is then closed by a tap to prevent the escape of the steam, which, by its force, cracks the coal away from the roof, and then follows the expansion of the lime.

— A system of irrigation is on trial in Colorado, in which the water is conducted through pipes, laid a little below the surface several feet apart, and having small holes at intervals on the upper side to permit of the escape of the water, which percolates through and thoroughly moistens the soil. The advantages are claimed, that the surface of the soil is not chilled by flooding, and that the ground is not subsequently baked by the hot sun.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Phylloxera.

WHAT evidence have we on the following points in regard to phylloxera? —

First, was it well known as a pest in this country before its introduction abroad?

Second, when and how did it reach Europe?

Third, why is it more injurious in Europe than in its native habitat? and

Fourth, is there any reason to suppose that the pest will be mitigated by natural causes as time goes on?

A. M. D.

New York, March 29.

Certain questions relating to national endowment of research in this country, and their importance.

I have read with interest Dr. Shufeldt's arguments in *Science*, favoring endowment of research, and the recognition on the part of the government "of those persons in her employ who have from time to time demonstrated their fitness to perform certain work," but I would like to ask the talented author why he would restrict this recognition to those in the government's employ, or why, indeed, there should be any distinction made between such men and other able men in civil life. The physician who finds that he is far better qualified for some other pursuit than that of medicine gives up his profession, and accepts a position where his talents can be better applied. Is not the same resource left for army officers? Dr. Shufeldt will hardly claim a monopoly of talent in government employ; then why are not the many struggling students of science in civil life who have shown evidence of their fitness to perform certain work equally entitled to recognition? By all means, if such a scheme is feasible, endow or assist original research, but put all citizens absolutely on the same level. While one may sympathize with the talented officers who are compelled to undergo wearisome drudgery not akin to their tastes or inclination, it cannot be forgotten that there are many other equally talented scientific men who have to struggle without even the assurance of a comfortable salary. Endow research, but let the endowment be impartial.

W. S. N.

New Haven, Conn., March 27.

The anachronisms of pictures.

Supplementing your recent publications touching the above-named subject, an example interesting to geographical botanists may be recorded among the existing curiosities of the national capitol.

The senate committee in charge of the fine arts has secured a picture representing a well-known incident in the life of Columbus, that occurred in old Spain anterior to the discoverer's first trans-Atlantic voyage. This picture is hung at the head of the marble stairway near the seats reserved in the senate hall for the ambassadors of foreign powers. It proclaims to the world that the plant (the *Opuntia* [cactus of Linneus] *ficus indica*, or prickly pear) which has figured in Mexican patriotic symbolism from time out of mind, and which holds the most prominent place in the oldest of Aztec legends, — the plant which Mexico regenerate has chosen as an emblem sanctified by association and antiquity, and has placed upon her banner and her dollar, — this senatorial picture proclaims that this cactus, so dear to the patriotic Mexican heart, is not originally Mexican, but that it was a possession of the usurper, and in pre-Columbian times grew by the dusty wayside in old Spain. That it had not reached Europe at the date of the incident represented in the picture, there can be no doubt.

I would refer the student to Alfonse de Candolle's work, 'Origin of cultivated plants' (*Appleton*, 1885), p. 275. Speaking of the *Opuntia ficus indica*, the eminent botanist says, "It was one of the first plants which the Spaniards introduced into the old world, both into Europe and Asia. Its singular appearance was the more striking that no other species belonging

to the family had before been seen." Should the student wish to investigate still further, he will find in de Candolle's treatise the names of several Spanish and other authorities.

NOPAL.

New York, March 29.

Schwatka's Along Alaska's great river.

The author of the review of Schwatka's work on the Yukon (p. 294) is evidently ill-informed as to the history and present state of the mapping of that river, when he states that Raymond 'surveyed' it from Fort Yukon to its mouth, and supposes that the map of Raymond is the 'best in existence' of the lower Yukon. It is probable that he derives his impression from Schwatka's work; that gentleman, like many military men, preferring to ignore or affect contempt of any work done outside of military circles. The fact is, that Raymond's map has at present merely an historical value, and was originally merely one step in the many by which an approximate sketch of the course of that great stream has been arrived at. The first explorations were by the Russians, and are summarized in the map of Zogoskin, which, for the part included in it (except at the mouth of the river), has not been materially changed by any one, though positions have been better determined, and details added or subtracted. The river between the end of the Zogoskin map and Fort Yukon, and the delta, were mapped by the Western union telegraph expedition, whose work as to detail is fuller than any thing subsequent. They also sketched the upper river, but it was reserved for Raymond to correct the astronomical positions of important points, and thus modify the general course; to Schwatka and Krause, to furnish better details of the Lewis branch and head waters; to Nelson, to do the same for the delta, and Lieutenant Allen for the Tananah watershed. The credit due to each cannot be monopolized by any man or set of men, and it does not impair any man's reputation to do justly by his forerunners.

WM. H. DALL.

Smithsonian institution,
March 27.

A swindler abroad again.

Please give place to an advertisement of a fraud who has just left Oskaloosa. He came on the 6th, remained six days, and left without having caused sufficient suspicion for any one to say any thing. He professes to be Prof. Henry S. Williams of Cornell university, N. Y., a captain on the retired list of the U. S. army, — retired for disabilities resulting from wounds received from the Indians three days after General Custer fell. He is now representing the Smithsonian institution as a sort of an examiner, looking after books and specimens deposited at different places. He also represents that Cornell has a fund which makes it possible for them to sell for fifty dollars a set of fossils equal to sets sold by Ward for eight hundred and fifty dollars, and that they only want five dollars cash to pay for boxing and labelling, the remainder to be paid from time to time in local fossils, for which reasonable prices will be allowed. He contracted two sets here, but received the five dollars on but one of them.

He is about five feet eight inches high, weighs about one hundred and forty pounds, carries his right arm as though stiff, wears a glove on that hand, has light-brown straight hair, mustache, blue eyes, a

large head with prominent forehead, so that his eyes seem a little sunken, and uses tobacco and whiskey tolerably freely for a professional man. We *know* he has a whole right arm and hand, and it is quite possible nothing is the matter with it. He talks very freely and accurately of fossils, books, and men, can give minute details of events in Indian warfare of ten and more years ago, which some of our citizens know to be literally true. He spends his money very freely, and seems to have plenty of it.

There is a general feeling that he worked some one for one hundred and eighty dollars, but, if so, whoever it was will not tell it. The amount is indicated, because it is rumored he draws one hundred and eighty dollars per month from the army. I cannot find who started it. If he has not done so, he certainly missed a good chance. A despatch from Humboldt to the Des Moines *Register* says he has been there and got about one hundred dollars.

ERASMUS HAWORTH.

Penn college, Oskaloosa, Io.,
March 24.

Bancroft's History of Alaska.

In your review of Bancroft's 'Alaska,' published yesterday, you speak of the transfer of that region, and the surrender of the despotic sway of the Russian American company, only to be renewed by one of our own, or, to use your words, "while the monopoly which succeeded, though more confined in scope than that of the Russian company, does not differ in its essential details, and is still in operation."

The entire area of Alaska is to-day, and has been since the purchase, open and free to all comers, in so far as the fur-trade is concerned, with the single exception of that reservation of the government for the protection of the seal-life on the Pribylov Islands, in Bering Sea: these small islets are completely isolated, and far removed from contact with the trade of that region, and are practically unknown to everybody outside of their narrow limits, except the officers of the government and the employees of the A. C. Co.

Competing traders are found at every little post in Alaska to-day where the fur-trade will warrant the establishment of the smallest trader and his outfit. There never has been the slightest interference with the prosecution of the fur-trade in Alaska since 1867 by any monopoly whatsoever.

HENRY W. ELLIOTT.

Smithsonian institution, March 27.

[The statements of the above letter, in so far as they are accurate, are theoretically true: the statement of the reviewer, in his judgment, better represents the social and commercial facts, as regards the whole territory, except the small area about Sitka.—REV.]

Names of the Canadian Rocky Mountain peaks.

An error in my article, printed in *Science*, vii, No. 162, is kindly pointed out by Dr. George M. Dawson of the Canadian geological survey, which I am glad to correct for your readers. Dr. Dawson tells me that the peaks of the Rocky Mountains, Hooker, Bal-four, Brown, etc., were not named by the botanist Douglas, as I stated, but by Dr. Hector, now in charge of the geological survey of New Zealand, who in 1857-59 was attached to Captain Palliser's expedition into the north-west.

ERNEST INGERSOLL.

New Haven, March 25.

SCIENCE.—SUPPLEMENT.

FRIDAY, APRIL 2, 1886.

INDUCED SOMNAMBULISM.

THE activity with which the study of mental phenomena, and especially of hypnotism, is now being pursued, is remarkable. Constantly publications are being brought to our notice, dealing with these popular topics, either in a literary, an empirical, or scientific way. Among the last to claim attention is a little work¹ by Prof. H. Beaunis of the faculty of medicine at Nancy, who has attempted to apply to the study of induced somnambulism scientific experimental methods. His work deals with the question from both physiological and psychological points of view, and treats of both mental and physical conditions. The substance of his more important observations and deductions, in the concluding chapters, is here presented.

What is the mental state of the hypnotized person during sleep? Is the intelligence active, and are the thoughts of the subject engaged? Observations seem to show that there is an absolute repose of the thoughts, except when under the influence of external impressions. When a hypnotized subject is asked of what he is thinking, the response is nearly always, 'Of nothing.' There is a state of intellectual inertia, or, better, of intellectual repose, in accord with the physical aspect of the hypnotized person: the body is immovable, the features impassible, with a general expression of calmness and tranquillity rarely attained in ordinary sleep. There are evidently no dreams nor thoughts of any kind; for those subjects who recollect very well whatever has transpired in some previous like condition recall nothing of an hypnotic sleep during which there have been received no external impressions.

Thus, contrary to the opinion of many physicians, undisturbed hypnotic sleep may be regarded as more recuperative; and from the observations made, both by the author and Dr. Liébeault, a part of the therapeutic effects produced by hypnotism may be attributed to the beneficial character of the induced sleep. It is often asked whether, in ordinary sleep, the brain remains inactive, and many reasons have been given to prove the contrary. Facts, however, seem to show, that, when

it is profound, the brain is really as inactive as in the induced sleep.

This inertia of thought is, however, only a conditional one in hypnotism: the merest suggestion, a single word pronounced by the hypnotizer, suffices to produce an activity that may be very highly developed, sometimes even more than in the normal state. The judgment of the hypnotized person is good, and in general he reasons correctly and logically. "That which is the most striking," says Dr. Liébeault, "is his power of deduction: whatever may be the result of his intellectual elaboration, his train of reasoning is logical and rapid." It seems, then, incorrect to consider the hypnotized person as an unconscious machine, incapable of reasoning and of judgment, as Pitres has done. It is true, he lacks the impelling motive; but impulsion once given, the intellectual machine is set in motion with more regularity and precision than in the waking state even.

The author says, however, that he has never observed the marvellous phenomena admitted by certain magnetizers, such as mental divination, second sight, prophetic powers, etc. The subjects were never able to divine the nature of an object enclosed in the hand, nor to tell one's thoughts, or events that had transpired unknown to them. In regard to predictions, the same was likewise true: a subject was never able to announce any event in advance in which the prediction was realized. A fact which the author has tested many times, and which seems to admit of no doubt, is that certain subjects are able to recognize by the touch, or at least without the aid of sight or hearing, the sex and approximate age of persons with whom they come in contact; and in many cases the subject was able to designate immediately, upon seeing persons unknown to them, the nature and location of maladies under which they were suffering. All such facts of hypnotism, however strange they appear, may be explained by an increased activity of the senses, by an excessive sensorial sensitiveness, such as is known to occur in the somnambulist.

There is one point of special interest in the mental state of the hypnotized person which the author examined with care. Will the somnambulist prevaricate or lie while in that condition? According to Pitres, certain subjects during the hypnotic state falsify voluntarily and knowingly; but such cases were never observed by the author.

¹ *Le somnambulisme provoqué, études physiologiques et psychologiques.* Paris, Baillière, 1886. 12°.

Sometimes they would refuse to reply to questions, or would hesitate in answering, but in no case did he ever know of their telling a downright falsehood. Were it possible to test those naturally vicious, the results might be different; and it would be of great interest to examine, in this respect, the professional criminal. The hypnotized person, in fine, is entirely open, not only in his actions, but also in his most intimate thoughts and sentiments: every thing appears — vices, faults, virtues, passions — with entire simplicity and the most complete *naïveté*.

One of the most difficult problems in induced somnambulism is that of the relation existing between the subject and the hypnotizer. No matter how profound the sleep may be, the subject understands all that is said to him by the hypnotizer, though he may not understand that which is addressed by the latter to a third person. This relation is established through any or all of the senses. Though the hypnotizer may use the utmost precaution not to reveal his presence in taking the hand of the subject, he will immediately be recognized, and the subject will obey the impressions conveyed. Should the subject's arm be raised, it will remain in any given position, though, if done by a third person, it will fall immediately inert. Let passes be made in his immediate proximity, either in front or behind, and the subject will recognize whether they are done by the hypnotizer or some strange person. Can this be attributed to a superexcitation of the tactile sensibility? One cannot say. If the subject is asked how he knows who it is that makes these passes, he invariably replies, that he feels him. A subject may be placed *en rapport* with a third person by the simple command of the hypnotizer, when he will obey him with the same implicitness.

In what, then, does this singular phenomenon of the relation between hypnotizer and hypnotized consist? Noizet and Bertrand, together with Dr. Liébeault, accept the explanation of this affinity or relation as the result of the attention given to the hypnotizer by the subject while being placed in that condition, and that it does not differ from that seen every day in ordinary sleep. A mother sleeping near the cradle of her child does not cease to watch over it, and, though insensible to the loudest tones, is conscious of the lightest cry of her infant. By this hypothesis the imagination of the subject produces the effect, and there is no special relation, physical or physiological, between hypnotizer and hypnotized. The subject, says Carpenter, is possessed by a preconceived conviction that one particular individual is destined to exercise upon him an especial influence, and that

it is the effect of a predominant idea suggested, directly or indirectly, by the magnetizer himself. Persons who hypnotize themselves for the first time, and without placing their thoughts especially upon any one person, are apt to receive the impressions of any by-stander.

Although certain facts seem to substantiate these views, there are others which are not easily explained by them, and which seem to indicate some real relation between hypnotizer and hypnotized.

Any attempt to explain these varied phenomena, or to establish some general theory of induced somnambulism, is yet premature; nor will the solution of the problem be possible till the functions of the brain, and especially the physiology of natural sleep, are better known than they are at present. One may, however, seek solutions of particular groups of phenomena.

By many authors most of the phenomena are explained by the concentration of attention, — the concentration of thought. It is well known that the mind may exert a most remarkable power over the organism, controlling or producing the most lively sensations of pain, and even causing sickness or death; but attention or concentration gives no real explanation. According to Durand de Gros, the essential feature is the suspension of all mental activity, except in some one direction; and, as nervous force continues to accumulate in the brain, there results a nervous congestion. The direction of this force in any one particular course, or to any sensorial organ, augments the activity in an extraordinary degree.

This influence of the attention and the concentration of thought in the phenomena of hypnotism may be readily accepted, especially so far as they concern the sensations; but there are facts that are not easily explained by them. One may understand that a hypnotized person, under the influence of an immediate impression, may believe that he sees or hears an absent person; but how can the fact be explained that the subject will see or hear him at a certain time, a week or more distant, when he has been so told by the hypnotizer? Does the hallucination rest wholly in abeyance during these days, to re-appear at a fixed time? Has there been a concentration of thought during all this time?

There are also other facts that must be taken into consideration. How does concentration of thought cause certain physiological phenomena, such as variations in the beating of the heart, redness and congestion of the skin, the production of blisters, etc., which are known to occur in the hypnotic state? Neither the will alone, nor suggestions from without, seem to be sufficient to

explain them. There must be some modification of the cerebral innervation, a receptivity and an aptitude very different from those in the normal state.

A distinct and strong impression must be made upon the somnambulist in order to command his attention, — a nervous shock arresting the course of his thoughts. This cerebral shock, if it may be so expressed, seems to be the *sine qua non* of success: it produces a sort of cerebral modification, some particular unknown state, without which impressions can have no effect. It is of interest to inquire whether we do not find analogous physiological or pathological states. There would seem to be certain features of surgical shock following severe operations, and causing singular conditions of mental alienation, that are similar; and is there not also a resemblance shown in the condition of deep mental abstraction witnessed in some persons? The characteristic trait of all these different conditions is a momentary suspension, more or less complete, of cerebral activity. This suspension may present all varying degrees, from the profound collapse following surgical operation, to the simple mental distraction.

THE NATURE OF SO-CALLED DOUBLE CONSCIOUSNESS AND TRIPLE CONSCIOUSNESS.

THERE is a rather widely spread impression that human beings can be subjects of double consciousness, and can lead two separate lives, in each of which the individual has a distinct set of personal characteristics. Illustrations of this supposed psychological possibility are found in many recent works of fiction, notably in the 'Archibald Malmaison' of Julian Hawthorne, and 'Called back' of Hugh Conway. Some medico-legal interest has also been attached to the question in a number of instances. Having had one case somewhat of this character under observation, I have been led to examine the matter critically.

There are on record in French, German, English, and American medical literature only seventeen cases whose history in any way entitles them to come under the designation of cases of double consciousness. Most of them were reported from forty to sixty years ago, and without very great accuracy in detail. An examination of all these histories, and the study of cases allied to them, lead one very positively to the conclusion that such a thing as a true double consciousness, or dual life, does not exist. There are several striking instances in which persons have lived an apparently double life, but in each case the second life represented simply a partial activity of the

patient's brain. In the second and morbid state a portion, viz., the higher volitional centres, have their activity inhibited, the mind is dull, the disposition apathetic, and memory of the past is gone. Indeed, this loss of the faculty by which stored-up impressions of the past are revived is the main psychological feature of some cases.

In 1845 Dr. Skae reported the case of a lawyer, of whom he said, "He appears to have a double consciousness, a sort of twofold existence, one half of which he spends in the rational and intelligent discharge of his duties; the other, in a state of helpless hypochondriasis, almost amounting to complete aberration." His attacks occurred every other day. In the classical case reported by Azam, the patient, in one mental state, was dull, apathetic, and little better than an automaton, showing here, again, that it was a condition in which some of her mental faculties were suspended. A Kentucky farmer twenty-three years old was accidentally struck on the head with a hammer. He was unconscious for several hours, but recovered, and seemed as well as ever. He married, and had children, but, after eight years, began to show signs of insanity. He was trephined, and his mental faculties were completely restored; but the whole eight years since the blow on his head was a complete blank. He did not know his wife, or children, or any of his later associates. This was not so much a case of double consciousness, though so reported, as of loss of memory.

The theory that the two mental states correspond with special activity of one side or the other side of the brain, is not at all tenable, because, if for no other reason, one of the cerebral hemispheres may be almost entirely destroyed, or its connecting commissure may be injured or absent without producing any such phenomenon as double consciousness, or a change in personality. Besides, there have been at least two cases reported in which three different mental states occurred. One of them was recently reported by J. Voisin. A young man suffering from hysteria major had an attack of amnesia, or loss of memory, lasting for a year: there was entire forgetfulness of his past, a change in his character and demeanor. This state could be artificially changed into a third state by hypnotizing him, after which he would return to his second or abnormal state. After being restored to his normal mind for a year, he had another attack of amnesia, lasting three months, and during this time he remembered only what had happened in his previous attack.

States of double or triple consciousness are either disorders of memory, or instances of suspension of the higher volitional powers, being then cases of hypnotism or of the epileptic automatic

state. Double consciousness or triple consciousness never occurs in healthy people, but only in the hysterical, epileptic, insane, or in those who have had severe shocks or injuries to the head. Dramatists and writers of fiction should bear this in mind, if they wish to cling to the realities.

CHARLES L. DANA, M.D.

FOOD-ACCESSORIES: THEIR INFLUENCE ON DIGESTION.

THE results of experimental inquiries on the subject of foods and food-digestion, when scientifically conducted, cannot help being of great practical importance to man, so intimately is his physical perfection and intellectual activity dependent upon his alimentation. Among the results of certain experiments on this subject by Sir W. Roberts, as given in the *Nineteenth century*, the following will be found of interest.

Man, as the author says, is a very complex feeder: he has departed, in the course of his civilization, very widely from the monotonous uniformity of diet observed in animals in the wild state. Not only does he differ from other animals in cooking his food, but he adds to his food a greater or less number of condiments for the purpose of increasing its flavor and attractiveness; but, above and beyond this, the complexity of his food-habits is greatly increased by the custom of partaking, in considerable quantity, of certain stimulants and restoratives, such as tea, coffee, cocoa, and the various alcoholic beverages, which have become essential to his social comfort, if not to his physical well-being.

But the generalized food-customs of mankind are not to be viewed as random practices adopted to please the palate or gratify our idle or vicious appetite. These customs must be regarded as the outcome of profound instincts, which correspond to important wants of the human economy. They are the fruit of colossal experience, accumulated through successive generations. They have the same weight and significance as other kindred facts of natural history, and are fitted to yield to observation and study lessons of the highest scientific and practical value.

First, with respect to the action of ardent spirits on digestion, experiments were made with 'proof-spirit,' and with brandy, Scotch whiskey, and gin; and the conclusion is, that, so far as salivary digestion is concerned, these spirits, when used in moderation and well diluted, as they usually are when employed dietetically, rather promote than retard this part of the digestive process; and this they do by causing an increased flow of saliva.

The proportion must not, however, much exceed five per cent; and gin seems to be less injurious than either brandy or whiskey. It was noticed in these experiments that both of these interfered with the digestive process, precipitating the starch more readily, altogether out of proportion to the amount of alcohol they contained, and brandy was worse than whiskey; and this circumstance appears to be due to certain ethers and volatile oils in them; and brandy contains a trace of tannin, which has an intensely retarding influence on salivary digestion. Even very small quantities of the stronger and lighter wines — sherry, hock, claret, and port — exercise a powerful retarding influence on salivary digestion. This is due to the acid — not the alcohol — they contain, and if this acid be neutralized, as it often is in practice, by mixing with the wine some effervescent alkaline water, the disturbing effect on salivary digestion is removed.

In the case of vinegar, it was found that 1 part in 5,000 sensibly retarded this process, a proportion of 1 in 1,000 rendered it very slow, and of 1 in 500 arrested it completely; so that, when acid salads are taken with bread, the effect of the acid is to prevent any salivary digestion of the latter, — a matter of little moment to a person with a vigorous digestion, but to a feeble dyspeptic one of some importance. There is a very wide-spread belief that drinking vinegar is an efficacious means of avoiding getting fat; and this popular belief would appear, from these experimental observations, to be well founded. If the vinegar be taken at the same time as farinaceous food, it will greatly interfere with its digestion and assimilation.

Effervescent table-waters, if they consist simply of pure water charged with carbonic acid, exercise a considerable retarding influence on salivary digestion; but if they also contain alkaline carbonates, as most of the table-waters of commerce do, the presence of the alkali quite removes this retarding effect.

With regard to 'peptic' digestion, the results are still more surprising. It was found that with ten per cent and under, of proof-spirit, there was no appreciable retardation, and only a slight retardation with twenty per cent; but with large percentages it was very different, and with fifty per cent the digestive ferment was almost paralyzed. It was also observed that the weaker forms of alcoholic drinks (wines and beer) differed greatly in the influence on peptic digestion from that of the distilled spirits. They retarded it altogether out of proportion to the quantity of alcohol they contained. Port and sherry exercised a great retarding effect. Even in the proportion of twenty

per cent, sherry trebled the time in which digestion was completed. It should further be borne in mind that this wine also retards greatly salivary digestion. Sherry, then, is injurious for persons of feeble digestive powers. With hock, claret, and champagne, it was also ascertained that their retarding effect on digestion was out of proportion to the alcohol contained in them; but champagne was found to have a markedly less retarding effect than hock and claret, due apparently to the mechanical effects of its effervescent qualities. The quantity of claret and hock often consumed by many persons at meals must exercise a considerable retarding effect on peptic digestion; but small quantities of these wines (and even of sherry) may not produce any appreciable retarding effect, but act as pure stimulants.

With regard to malt liquors it was observed, as with wines, that they retarded peptic digestion in a degree altogether out of proportion to the amount of alcohol contained in them; and, when taken in large quantities, they must greatly retard the digestion, especially of farinaceous food.

Tea, coffee, and cocoa were found to exert varying degrees of influence on the salivary digestion. The medium strength of the tea usually drunk is estimated at four to five per cent: strong tea may contain as much as seven per cent; weak tea, as little as two per cent. Medium coffee has a strength of about seven per cent, and strong coffee twelve to fifteen per cent; cocoa, on the other hand, is generally weaker, not more than about two per cent, and this may be one reason why it is more suitable to persons with feeble digestions than tea or coffee. Tea exercises a powerful inhibitory effect on salivary digestion, and this appears to be entirely due to the large quantity of tannin it contains; and, in order to diminish as far as possible its retarding influence on salivary digestion, it should be made weak and used sparingly, and it should not be taken with, but after, the meal. Coffee, unless taken in very large quantity, has very little retarding effect on salivary digestion: this is explained by the fact that the tannin of tea is replaced in coffee by a substance called *caffeo-tannic acid*. Cocoa resembles coffee, and has little or no effect on salivary digestion: the use of coffee or cocoa is therefore preferable to that of tea, for persons of feeble digestion.

With respect to the influence of tea and coffee on stomach digestion, it was found that they both exercised a remarkable retarding effect. There was no appreciable difference in the two beverages if they were of equal strength; but, as

coffee is usually made of greater percentage strength than tea, its effect must ordinarily be greater. Cocoa also had much the same effect if used of the same strength as tea or coffee; but when of the strength ordinarily employed, its effect was inconsiderable. Strong coffee — *café noir* — had a very powerful retarding effect, and persons of weak digestion should avoid the customary cup of 'black coffee' after dinner.

Perhaps one of the most unexpected results of these experiments was the discovery that beef-tea had a powerful retarding effect on peptic digestion, as much so as that of a five-per-cent infusion of tea. Further researches appear to show that this retarding effect of beef-tea was due to the salts of the organic acids contained in it. Beef-tea contains but very little nutritive properties, and must therefore be looked upon rather as a stimulant and restorative than as a nutrient beverage, but it is nevertheless very valuable on account of those properties.

The author holds the view, that, in healthy and strong persons, the retarding effect on digestion, observed to be produced by many of the most commonly consumed food-accessories, answers a distinctly useful end. They serve, he maintains, the purpose of wholesomely slowing the otherwise too rapid digestion and absorption of copious meals. A too rapid digestion and absorption of food may be compared to feeding a fire with straw instead of slower-burning coal. In the former case it would be necessary to feed often and little, and the process would be wasteful of the fuel; for the short-lived blaze would carry most of the heat up the chimney. To burn fuel economically, and to utilize the heat to the utmost, the fire must be damped down, so as to insure slow as well as complete combustion. So with human digestion: our highly prepared and highly cooked food requires, in the healthy and vigorous, that the digestive fires should be damped down, in order to insure the economical use of food. We render food by preparation as capable as possible of being completely exhausted of its nutrient properties; and, on the other hand, to prevent this nutrient matter from being wastefully hurried through the body, we make use of agents which abate the speed of digestion.

These remarks will apply, however, only to those who possess a healthy and active digestion. To the feeble and dyspeptic any food-accessory which adds to the labor and prolongs the time of digestion must be prejudicial; and it is a matter of common experience that beverages which in quantity retard digestion have to be avoided altogether by such persons, or partaken of very sparingly.

DEATH-RATE AND SANITATION IN
RUSSIA.

A SERIES of admirable articles on vital statistics and the importance of sanitary measures is now appearing in one of the St. Petersburg daily papers, says the *Lancet*, founded on a paper by Dr. Eck. The statistics given are certainly of a nature to set every one in Russia thinking seriously about taking measures to improve them. Thus for the year 1882, which seems to be the last year whose vital statistics are available, the mortality in the ten southern provinces was 2.6 per cent; in the seven eastern provinces, 3.9 per cent; in the thirteen middle provinces, 6.2 per cent; in the sixteen western provinces, 3.1 per cent; and in the fourteen northern provinces, 3.7 per cent. After mentioning the various sanitary improvements called for, as drainage of various kinds, a supply of wholesome drinking-water, attention to and regulations about buildings of all descriptions, and the establishment of infectious hospitals, Dr. Eck goes on to say: "There is no need for us to puzzle ourselves how these matters are to be done; England has accomplished so much, that we need simply adapt what is ready to our hands to our own circumstances. In Germany, France, Austria, and Italy, steps are already being taken in the same direction, and all these countries take England as their chief model, so that we need not be ashamed to do so too." He then appeals to the economic importance to Russia of a reduction of the mortality.

On the principle of example being better than precept, he goes into a long but easily comprehensible calculation of the comparative working-value of horses whose ages at death vary; and he then takes the respective death-rates of Russia (35), Germany (27), and England (19), and, by means of a method of computation unusual amongst British statisticians, explains that they show that an Englishman has 53 years of life, while a German has 37, and a Russian 29 only. Reckoning a man's working-years to commence at the age of 18, an Englishman has 35 years in which to earn, against the Russian's 11; and the latter will probably not save much more in his 11 working-years, above what it costs him to live, than has been already expended upon him during his 18 unproductive years; but an Englishman will have 24 years more in which to go on earning and saving. Again, out of 1,000 inhabitants in Russia, only 373, or 37 per cent, are of an age to earn, while in England there are 660, or 66 per cent; or each individual of working-age in Russia has to provide for two non-workers, while in England he has only half a non-worker for whom to be responsible.

MUIR'S THERMAL CHEMISTRY.

THE recognition of the dual character of the phenomena involved in chemical operations is no new thing; but it is only of late that the attempt has been made to determine the relationship between transformations of matter and concurrent changes of energy, and the efforts to this end have been made almost wholly in the direction of thermal phenomena, — in the investigation of the quantities of heat which enter or leave a chemical system during the transition between accurately defined initial and final states, in a so-called chemical change.

Mr. Muir's presentation of the condition and aims of the thermal chemistry of to-day is opportune. Based as a matter of necessity upon the researches of Thomsen and Berthelot, it fairly bristles with references to the works of these masters, and, indeed, to all original papers of importance in the discussion of the subject. Following an outline sketch of the theory of energy and the molecular hypothesis, the author discusses successively the methods of thermal experimentation and their application to the phenomena of allotropy; isomerism; the neutralization of acids by bases, and bases by acids; the relative avidity (as Thomsen terms it) of acids; the classification of elements and compounds in accordance with thermo-chemical properties; the phenomena of melting, boiling, evaporation, dissociation, solution, and hydration; and, finally, the chemical interpretation of thermal data. Only such facts as are immediately of use for purposes of illustration appear in the body of the book; but all well-established data of the subject (excepting such as relate to boiling and melting points and specific heats, for which reference elsewhere is made) are to be found in the five appendices, which comprise a third of the matter between the covers of the volume.

The work is for the most part independent in opinion, and, with no pretence to exhaustiveness, sufficiently full for the purposes of the general reader, and quite intelligible to one acquainted with the elements of general chemistry and modern ideas of energy. Facts are presented fearlessly and as separate as may be from the constraint of theory, and the explanation is fitted to the facts.

The stumbling-block in the way of the interpretation of thermal values is the difficulty, often the impossibility, of determining what portion of a thermal change is of chemical origin, and what is physical; and it is not surprising to find the use

The elements of thermal chemistry. By M. M. PATTISON MUIR, assisted by David Muir Wilson. London, Macmillan, 1885. 8°.

of thermal relations in the matter of classification regarded as only supplementary, and even the 'law of maximum work' degraded to a mild assertion of the general probability of the occurrence, under physical conditions as nearly constant as possible, of that one of conceivable operations which shall evolve the greatest quantity of heat. Fortunately in the measure of relative affinities the effect of physical disturbance is at a minimum; and it is on this line that the author predicts, and rightly, as it seems, the surest advance. Mr. Muir has laid his audience under obligations; and, in view of the excellence of the work, some few depreciatory (perhaps quixotic) references to the baleful influences of structural chemistry and the bond theory will doubtless be passed over lightly.

NEW YORK AGRICULTURAL EXPERIMENT-STATION.

THE fourth report of the New York experiment-station contains the results of a vast amount of work upon various branches of agricultural inquiry; and, if the first impression which it makes is of a certain vagueness and lack of definiteness in its conclusions, a further study shows that much of this effect is due to the magnitude of the problems attacked, and the consequent incomplete character of the work at present.

As in former years, the work of the station has been largely botanical and horticultural in its nature, although other subjects have also received considerable attention, particularly stock-feeding and related subjects.

The work of the chemist upon the relative volume of the fat-globules in milk from different sources, and upon the structure of these globules, is full of interesting and suggestive results. By means of an ingenious method of his own devising, he has been able to determine microscopically the number of fat-globules in a given bulk of milk, and, by combination with the results of chemical analysis, their average volume. By this method he has shown, that, when milk is churned at a temperature above the melting-point of butter-fat, the number of fat-globules is increased: in other words, the fat-globules can be divided. He has thus, it would seem, disposed finally of the theory of a membrane surrounding the fat-globules, and completed the proof that milk is an emulsion, and behaves essentially like any other emulsion.

Fourth annual report of the Board of control of the New York agricultural experiment-station, for the year 1885; with the reports of the director and officers. Rochester, N.Y., E. R. Andrews, pr., 1886. 8°.

But it is on the botanical and horticultural sides, as already intimated, that we find the greatest amount of work expended, and the most comprehensive plan of operations. There are, among other things, a botanical description and provisional classification of forty-three varieties of wheat, and a description of the leading varieties of lettuce (eighty-seven in number, according to the station's classification, and gleaned from at least two hundred differently named lettuces by the labor of three seasons). There is also a description of the products of a hundred and forty-eight varieties of maize, planted under such conditions as to insure extensive cross-fertilization, and tending to show that the variations thus produced can be referred to named varieties. All this, it will be observed, is in the line of agricultural botany; and the report contains the records of a large amount of other work, with many species of plants which may sooner or later be available in the same direction.

We shall watch with interest this attempt to reduce to system the present chaos in the nomenclature of agricultural varieties. The director of the New York station is confident that these varieties are much more persistent than is usually supposed; and, in the interest of both science and practice, it is to be hoped that his confidence will be justified by the outcome of his own and his assistant's labor.

The report of the botanist deals largely with plant-diseases, the most interesting portion being the demonstration that pear-blight is due to the activity of a bacterium.

The student of agricultural science may be inclined to regret the time which has been spent upon numerous side-issues and single experiments of no scientific value, and to wish that the large resources of the station had been expended in more extended and thorough scientific work upon a few problems; but he will not forget that a public experiment-station is not a purely scientific institution, but has duties to the man of practice as well, which are often best subserved by experiments, in which the purely scientific man can see no value. We have before now taken occasion to express freely our belief in the greater ultimate value of scientific investigation; but we desire to record also our appreciation of the value of carefully performed and conscientiously reported 'practical' or 'empirical' experiments, such as are to be found in this report. The New York station appears to us to be doing excellent work in both directions, and it is to be hoped that the liberality of the state in providing means for its prosecution will serve as an incentive to other commonwealths.

MINOR BOOK NOTICES.

Climatology and mineral waters of the United States. By A. N. BELL. New York, Wood, 1885. 8°.

THIS is a work intended especially to present ascertained facts so as to render them available for the promotion of health. In addition to a full and readable discussion of the different meteorological agencies and factors, the author deals with the climatological topography of the different regions of the United States, with weather reviews, and descriptions of the different medicinal waters. To the invalid the work will have its greatest, and we believe a real, value; but to all who are interested in the influences of climate upon health, or even in general meteorology, it will be found very useful. The author arrives at the conclusion that no country in the world possesses a greater variety of climate or climates with a higher degree of salubrity than the United States.

Statics and dynamics for engineering students. By IRVING P. CHURCH. New York, Wiley, 1886. 8°.

THIS book, so far as one can judge from the contents, since there is no preface, is intended for use as an elementary text-book in theoretical mechanics by students who are to get elsewhere a good deal of practice in solving problems, and some additional instruction. The text is, on the whole, very clearly written, the diagrams are excellent, and the illustrative examples cannot fail to interest the reader as well as to instruct him. The use of the phrase 'square second' instead of 'per second per second,' in such expressions as "an acceleration equal to 32.2 feet per square second," will probably be new to most engineers. The few typographical errors which we have noticed in text and formulas are not misleading, although the insertion of the few words which have evidently fallen out of the last paragraph on p. 18 might help a beginner.

Drainage for health; or, Easy lessons in sanitary science. By JOSEPH WILSON. Philadelphia, Blakiston, 1886. 8°.

THIS is a revised edition of a work on drainage, house-plumbing, etc. It is written in quaint, laconic style, and impresses the reader with having been prepared by one of pronounced opinions. In some parts it is excessive, and as a literary model can hardly be recommended; nevertheless it contains some very good advice and instructions.

De la désinfection des wagons ayant servi au transport des animaux. By Dr. PAUL REDARD. Paris, Doin, 1885. 8°.

THIS is a work that should be of service in America, where the questions of cattle transportation have frequently been of no little importance. The work treats of the danger of transportation of diseased cattle in railroad-cars, with evidence

of the diffusion of epizootic diseases from such. It gives also the principal European laws regulating the disinfection of cattle-cars with the comparative values of the different means employed. The author concludes that the various chemical agents, such as phenic acid, chloride and sulphate of zinc, sulphur, etc., are inefficacious. The results obtained by superheated steam (230° F.) were constant and successful. He describes methods by which disinfection may thus be accomplished with speed and certainty.

Mechanical integrators, including the various forms of planimeters. By Prof. H. S. H. SHAW. New York, Van Nostrand, 1886. 24°.

IN this convenient little book we have a systematic presentation of the principles on which mechanical integrators and the various forms of planimeters are based. The divisions of the book are as follows; planimeters in which slipping of the measuring roller takes place; planimeters in which only pure rolling motion is assumed to take place; moment planimeters; continuous integrators; limits of accuracy of integrators, both theoretical and experimental. Many forms of these instruments are described, and a host of inventors named from all countries. Among them Professor Amsler still holds the first place for the variety of his inventions, and their adaptability to a wide range of calculations,—to finding areas, average pressure on indicator diagrams, centre of gravity, contents of embankments, etc. From his works at Schaffhausen, more than twelve thousand polar planimeters have been sent out. This paper was originally presented before the Institution of civil engineers, and the report of the discussion that followed it contains many interesting practical points with reference to the use of these instruments. As the importance of such mechanical aids in calculation is becoming more and more felt, a book like this is useful and welcome.

It is not often that a well-known scientific man has the melancholy pleasure of reading obituary notices of himself, as appears to have been the case with Dr. J. Jacob v. Tschudi, the South American explorer. *Natur* now corrects the error by stating that it was his brother, Friedrich von Tschudi, who died at St. Gall, Switzerland, on Jan. 24 last. Friedrich, though less known to American readers, did much good work in natural history of a popular or general character, the most important of which was his '*Thierleben der Alpenwelt.*' He was nearly sixty-four years of age. J. J. v. Tschudi, though four years his senior, is still actively engaged in research, as the frequent papers from his pen attest.